ISOLATED POWER SYSTEMS EQUIPMENT

1 APPLICABLE STANDARDS

These requirements cover **X**-Ray / **L**aser **P**ower **C**enters that incorporate an isolation transformer, one (1) primary circuit breaker, one (1) or more isolated ungrounded secondary circuits connected by conduit to remotely located receptacles, a reference ground bus, and a **L**ine **I**solation **M**onitor (LIM). There must be provisions for connection to remote indicators and for connection of grounding conductors to remote ground jacks, the room bonding points, and patient equipment grounding points.

Only one receptacle shall be energized at one time. If the receptacle selection is accomplished by means of a momentary pushbutton station or by limit switches at the receptacle location, the control logic and the electrical interlocks shall be provided by a Programmable Logic Controller (PLC). The limit switch shall have no moving parts. Each button at the pushbutton station shall have a built in LED to indicate that the associated receptacle has been selected. A mechanically interlocked pushbutton selector station shall also be acceptable as a method for selecting the X-Ray / Laser receptacle.

It shall be possible to accomodate X-Ray / Laser Receptacle Modules of varying complexity from the simplest which houses a receptacle and LIM remote indicator to the most complex which in addition has an "In Use" lamp, a remote indicator with either a digital or analog meter and a built in magnetic type limit switch with no moving parts.

The equipment must be Listed under UL1047 - Isolated Power Systems Equipment. The Components of these products covered under this standard are judged to include, but are not necessarily limited to the following:

Article 517 of the National Electric Code, NFPA 70
Standard for Health Care Facilities, NFPA 99
Standard for Line Isolation Monitors, UL 1022
Standard for Specialty Transformers, UL 506
Standard for Cabinets and Boxes, UL 50

2 PRODUCT

This section imposes additional constraints on the product addressing such topics as construction details, size, operator interface, and component performance. This information is intended to supplement the requirements imposed by UL 1047 which is the guiding and governing document in all matters concerning this specification.

2.1 ENCLOSURE FOR SINGLE OR THREE PHASE X-RAY / LASER POWER CENTERS UP TO 25kVA

2.1.1 Backbox

Shall be flush or surface mounted as indicated on the contract documents. Flush mounted units shall be fabricated from 14GA galvanized sheet steel. Surface mounted units shall be 14GA galvanized sheet steel and shall have a finish coat of hospital ivory, epoxy enamel. There shall be a space for a backplate with transformer shelf to mount an upright isolation transformer. The dimensions of the backbox shall be 48"H x 30"W x 12"D (up to 15kVA) or 48"H x 30"W x 14"D (up to 25kVA).

2.1.2 Backplate

Shall be fabricated from 12GA galvanized sheet steel. The backplate shall provide a mounting surface for all isolated power panel components except for the isolation transformer.
The backplate shall be mounted to the backbox by means of four (4) 3/8“ – 16 bolts.

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2.1.3 Transformer Shelf

Shall be fabricated 12GA galvanized sheet steel and securely mounted to the back box by means of four (4) 1/4" - 20 nuts and bolts. The isolation transformer shall be mounted on vibration mounts.

2.1.4 Front Trim

Shall be fabricated from 14GA Type 304 Stainless Steel, with #4 brushed finish and shall contain a flush door covering the circuit breaker section. The door shall contain a flush, keylocking slam-latch capable of being latched whether the latch is locked or not. A door stop shall shall be firmly attached to the interior of the front trim. All panels shall be keyed alike. Front trim shall contain a cut out for the LIM, which shall remain visible at all times. The front trim for flush mounted units extends 1" on all sides of the backbox. For surface mounted units, the front trim shall exactly match the dimensions of the backbox. The front trim shall be attached to the backbox by means of ten (10) #10-32 x 1" Stainless Steel Oval Head Phillips machine screws and ten (10) #10 Stainless Steel finishing washers.

2.2 COMPONENTS

2.2.1 Isolation Transformer

2.2.1.1 Single or three phase, 50 or 60Hz with primary and secondary voltages as indicated on the contract drawings.
2.2.1.2 Class H rated insulation.
2.2.1.3 Electrostatic shield between primary and secondary windings grounded to enclosure.
2.2.1.4 Electrostatic shield designed so that it will prevent direct shorting of primary winding to secondary winding, and will reduce the coupling of harmonic distortions between the primary and secondary circuits.
2.2.1.5 Core is of stacked design, securely clamped.
2.2.1.6 Core and coil vacuum impregnated with final wrap of insulating material.
2.2.1.7 Core and coils isolated from enclosure by means of a vibration dampening system.
2.2.1.8 Total leakage current to ground from transformer secondary winding in compliance with UL1047, Tables 30.1 and 30.2.
2.2.1.9 Maximum sound level of transformer: 25dB for 5kVA units or less, 30dB for 7.5kVA units, 35dB for 10 & 15kVA units, and 40dB for 20 & 25 KVA units.
2.2.1.10 Temperature rise limited to 115 degree C above ambient under full load conditions.
2.2.1.11 Transformer UL listed or recognized as a component for the voltages, amperages, and kVA ratings required.

2.2.2 Line Isolation Monitor (LIM)

2.2.2.1 Solid state modular assembly of printed circuit boards utilizing SMD technology.
2.2.2.2 Continuous monitoring of the impedance of each phase to ground.
2.2.2.3 Must be capable of detecting all combinations of capacitive, resistive, balanced, unbalanced and hybrid faults.
2.2.2.4 Total Hazard Current (THC) set at the factory to either 2mA or 5mA and shall be field adjustable to either milliampere.
2.2.2.5 Combined analog and digital display of THC.
2.2.2.6 Audible alarm which sounds in the event of a hazardous condition.
2.2.2.7 Indicating LEDs to visually indicate the status of the system. Green to indicate “SAFE”, red to indicate“HAZARD” and amber to indicate that the audible alarm is in the “MUTE” mode. All LEDs and buttons shall be flush with the face of the LIM.

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2.2.2.8 A "TEST" button on the LIM face shall be activated to test all LIM functions. It shall not be possible to leave the button in the "TEST" position.
2.2.2.9 The LIM shall perform an automatic self-calibration and self-check every twelve hours. An error code display shall alert the staff of an anomaly in the LIM / System operation.
2.2.2.10 Shall contain overload protection with an automatic reset feature.
2.2.2.11 It shall be possible to order the LIM with an optional RS485 communication port and load monitoring.
2.2.2.12 Field terminals shall be available for wiring remote LIM indicators with or without a display of THC.
2.2.2.13 Shall be UL Recognized as a component.
2.2.2.14 Shall have an easy to clean rugged Lexon front foil.
2.2.2.15 The LIM shall be BENDER Model LIM2000 or equivalent.

2.2.3 Primary Circuit Breaker

2.2.3.1 Two-pole or three-pole sized in accordance with NFPA 70-1996 (N.E.C.) and UL 1047 Standard and selected based on the transformer primary voltage as shown on the contract documents.
2.2.3.2 Full size, thermal magnetic type, with minimum 10,000 AIC.

2.2.4 Secondary Branch Circuit Breakers

2.2.4.1 Two-pole or three-pole, ampacities, and quantities based on the contract documents. Sized in accordance with NFPA 70 (N.E.C.) and UL 1047 Standard.
2.2.4.2 Full size, thermal magnetic type with minimum 10,000 AIC.

2.2.5 Circuit Contactors

Provide up to twelve (12) circuit contactors which shall energize up to twelve (12) X-Ray / Laser Receptacle Modules.

2.2.6 Circuit Selector

Provide one of the following circuit selectors:
- BENDER Type MK2010 pushbutton selector with momentary contact pushbuttons and built in LEDs mounted on the circuit breaker deadfront or ISOTROL SYSTEMS' Type RCS Remote Control Station.
- A mechanically interlocked push button station mounted on the circuit breaker deadfront
- Door switch (magnetic type, shall be UL Listed) on ISOTROL SYSTEMS' Type XRM / LRM, X-Ray / Laser Receptacle Module

Individual circuits are controlled by the PLC Programmable Logic Controller or mechanically interlocked pushbutton stations.

2.2.7 Programmable Logic Controller (PLC)

Shall provide up to 32 I/O ports and shall have the ability to store the programming for I/O configurations in case of a power failure.

2.2.8 Reference Ground Bus

Shall contain a minimum of one (1) #4-2/0 main lug and nineteen (19) #14-4 grounding lugs.

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3 REMOTE INDICATORS for LINE ISOLATION MONITORS (OPTIONAL)

Provide, where shown on the contract drawings, a single or multiple gang remote indicator which duplicates the audible and visual alarm indications of the LIM installed in the X-Ray / Laser Power Center. The remote indicator shall contain a green “SAFE” LED a red “HAZARD” LED and a “MUTE” button with integral amber LED. The remote indicator shall function as follows:

- The green LED stays illuminated when the leakage current is within predetermined limits.
- The green LED extinguishes and the red LED illuminates when the predetermined limit is exceeded; an audible alarm also sounds.
- When depressed, the “MUTE” button shall mute the audible alarm signal. Actuation of this button shall cause the integral amber LED to illuminate, indicating that the audible alarm has been silenced.
- When the leakage current has returned to the acceptable limit level, the alarm indicators shall automatically reset.
- Optional THC meter or digital meter.

4 INSTALLATION

Type XHHW wire crosslinked polyethylene insulation and a dielectric constant of less than 3.5 or less shall be used.

As necessary, special instructions shall be provided for field assembly, mounting and wiring the equipment. They shall be part of a documentation package which includes three (3) sets of Operation and Maintenance manuals. These manuals shall include written instructions on the care and maintenance of the system, spare parts lists and certified “as built” drawings for the material furnished to the facility. Included will be an electrical schematic, an interconnection diagram, an overall outline dimensional drawing, and a LIM User Manual.

5 TESTING & CERTIFICATION

An engineer or senior technician shall be provided by the manufacturer for final testing and acceptance of the Isolated Power System. The following tasks shall be performed:

- Simulate faults using the BENDER Type LT2000 Isolated Power Systems Test Kit, or equivalent. Repeat this test at each receptacle to ascertain that the LIM and associated branch circuit are functioning properly.
- Check the calibration of the LIM meter using the LT2000 Isolated Power Systems Test Kit, or equivalent, and record the readings. Record the date and data in a permanent log book.
- Certify that the system is properly installed and in correct working order.

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6 TRAINING

As required, training shall be provided for the hospital maintenance and medical staff covering the correct operation and routine testing of the Isolated Power System. The function of the LIM will be explained and its test function demonstrated. The hospital maintenance staff shall be instructed on the proper use of the test equipment. The proper method of recording and logging data shall be explained. Finally, a log book shall be furnished that contains the data logged by the factory engineer / technician during the initial testing phase.

7 ACCEPTABLE MANUFACTURERS

The equipment shall be provided by ISOTROL SYSTEMS or other approved supplier. Other suppliers seeking approval shall submit proof of their ability to comply with the requirements set forth in this specification.

8 APPROVAL SUBMITTALS

As part of the approval process, potential suppliers shall submit pertinent descriptive catalog literature. The following shop drawings shall also be submitted: a) Dimensional data, b) Transformer data, c) Line Isolation Monitor (LIM) details and performance data, d) Product specifications from the manufacturer, and e) Load center construction details including method of mounting, type of circuit breaker, current capacity, etc.

9 ADDRESS OF MANUFACTURER

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Notes: